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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/707,122

11/21/2003

Lawrence A. Clevenger

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INTERNATIONAL BUSINESS MACHINES CORPORATION

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EXAMINER

CHEN, JACK S J

ART UNIT

PAPER NUMBER

2813

DATE MAILED: 03/01/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No. 10/707,122	Applicant(s) CLEVENGER ET AL.	
	Examiner Jack Chen	Art Unit 2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 1 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☐ Claim(s) ____ is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☒ Claim(s) 1-24 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date ____. | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-18 and 23-24, drawn to a method for forming an interconnect structure, classified in class 438, subclass 687.
 - II. Claims 19-22, drawn to interconnect structure, classified in class 257, subclass 300+.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case, the product as claimed can be made by another and materially different process, such as instead of depositing a liner in the aperture and then removing the bottom portion of the liner to expose the lower interconnect member; one can selectively forming the liner through masking.
3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.
4. Because these inventions are distinct for the reasons given above and the search required for Group I is not required for Group II, restriction for examination purposes as indicated is proper.

Should Applicant elected the invention of Group I, then one of the following species must be elected:

5. This application contains claims directed to the following patentably distinct species of the claimed invention:

Species I (figs. 3-7) drawn to a method for forming an interconnect structure according to first embodiment. It appears that claims 1-11 and 23 read on this particular embodiment.

Species II (figs. 8-12) drawn to a method for forming an interconnect structure according to second embodiment. It appears that claims 12-18 and 24 read on this particular embodiment.

Should Applicant elected species I, then one from each of the following group must be elected:

A. material for the lower interconnect member (see specification, paragraph 0027)

A1. copper

A2. aluminum

A3. tungsten

B. material for the first liner (see specification, paragraph 0030)

B1. TaN

B2. Ta

B3. Ti

B4. Ti(Si)N

B5. W

C. material for the first liner (see specification, paragraph 0038)

C1. TaN

C2. Ta

C3. Ti

C4. Ti(Si)N

C5. W

D. gas for ion bombardment (see specification, paragraph 0034)

D1. Ar

D2. He

D3. Ne

D4. Xe

D5. N₂

D6. H₂

D7. NH₃

D8. N₂H₂

E. method for forming the first liner layer

E1. depositing a liner layer in the aperture then removing the liner layer on the bottom surface of the aperture (see specification, paragraph 0030-0034). It appears that claim 1 reads on this particular sub-species.

E2. simultaneously performing an ion bombardment and in-situ material deposition for the liner layer (see specification, paragraph 0035). It appears that claim 11 reads on this particular sub-species.

F. method for forming the second liner

F1. depositing the second liner layer on the lower interconnect. It appears that claim 2 reads on this particular sub-species.

F2. depositing the second liner layer not on the lower interconnect. It appears that claim 23 reads on this particular sub-species.

Should Applicant elected species II, then one from each of the following group must be elected:

A. material for the lower interconnect member (see specification, paragraph 0027)

A1. copper

A2. aluminum

A3. tungsten

B. material for the first liner (see specification, paragraph 0030)

B1. TaN

B2. Ta

B3. Ti

B4. Ti(Si)N

B5. W

C. material for the first liner (see specification, paragraph 0038)

C1. TaN

C2. Ta

C3. Ti

C4. Ti(Si)N

C5. W

D. gas for ion bombardment (see specification, paragraph 0034)

D1. Ar

D2. He

D3. Ne

D4. Xe

D5. N₂

D6. H₂

D7. NH₃

D8. N₂H₂

E. method for forming the first liner layer

E1. depositing a liner layer in the aperture then removing the liner layer on the bottom surface of the aperture (see specification, paragraph 0030-0034, 0043).

E2. simultaneously performing an ion bombardment and in-situ material deposition for the liner layer (see specification, paragraph 0035 and 0044).

F. method for forming the second liner

F1. depositing the second liner layer on the lower interconnect. It appears that claim 13 reads on this particular sub-species.

F2. depositing the second liner layer not on the lower interconnect. It appears that claim 24 reads on this particular sub-species.

Applicant is required under 35 U.S.C. 121 to elect a single disclosed species for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable. Currently, no claim is generic.

Applicant is advised that a reply to this requirement must include an identification of the species that is elected consonant with this requirement, and a listing of all claims readable thereon, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which are written in dependent form or otherwise include all the limitations of an allowed generic claim as provided by 37 CFR 1.141. If claims are added after the election, applicant must indicate which are readable upon the elected species. MPEP § 809.02(a).

Should applicant traverse on the ground that the species are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the species to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other invention.

Applicant is advised that the reply to this requirement to be complete must include an election of the invention to be examined even though the requirement be traversed (37 CFR 1.143).

6. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jack Chen whose telephone number is (571)272-1689. The examiner can normally be reached on Monday-Friday (9:00am-6:30pm) alternate Monday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl W. Whitehead can be reached on (571)272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Jack Chen
Primary Examiner
Art Unit 2813

February 22, 2005